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of the poison of the gall insect"; and Sir James Paget as late as 1880 said that "the most reasonable, if not the only reasonable theory, is that each insect infects or inoculates the leaf or other structure of the chosen plant with a poison peculiar to itself." In brief, the theory of a stimulus due to a chemical substance injected into the plant by the female at time of egg laying was the accepted view of scientists from the publication of Malpighi's "De Gallis" in 1686 until about thirty years ago. However, from about 1877 to 1882 there appeared a number of important publications by Dr. Hermann Adler and Dr. M. W. Beyerinck which in a great part disproved the previously almost undisputed theory. From this time the study of cecidology became a growing factor in plant physiology and plant pathology.

Beyerinck's work indicated that the fluid injected by mother insect was tasteless and odorless and not perceptibly irritating when injected under the skin and that it probably served only as an antiseptic dressing to the wound of the host plant. The work of both authors indicated that there was no cell activity on the part of the host plant leading to gall formation until the larvæ emerged from the egg. Adler, as a result of a careful study of the galls of *Neuroterus laeviusculus* and *Biorhiza aptera*, states that immediately following the emerging of the larvæ from the egg that there is a rapid division of the cells of the host plant due to the attacks of the larvæ. He was inclined to believe this due to the influence of salivary excretions. However, Adler also made a study of the Galls of *Nematus vallisnerii* on *Salix amygdalina*, which is produced immediately following oviposition and is fully developed before the hatching of the larvæ. This is probably the only well authenticated case of gall formation previous to the hatching of the larvæ and is undoubtedly the exception rather than the rule for gall builders.

It is well known that the gall makers belonging to the Cecidomyidæ, Aphididæ and Acarina do not puncture the plant tissues with

the ovipositors and that the young insects are, strictly speaking, never within the tissues of the host plant but are surrounded by plant growths due to an irritation by their own mouth parts.

At the present time there is no proof, except in the case of *Nematus vallisnerii* that the gall is due to a secretion from the mother insect. Whether due to a chemical or a mechanical irritation of the young insect are questions with as much circumstantial evidence for the one as for the other.

It may be added that the studies of the past few years on cecidia due to bacteria, myxomycetes, fungi and nematodes indicate certain striking resemblances to the zoo-cecidia and we have reason to believe that further researches into the anatomy and physiology of these various groups of hypertrophied structures will lead to valuable contributions to our knowledge of cecidology.

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THE AIR-BLADDER OF THE CLUPEOID FISHES

IN a recent letter (SCIENCE, October 13) Dr. E. C. Starks has suggested that the posterior opening of the air-bladder in *Clupea harengus* needs further investigation. This opening was originally described by Weber in 1820, was rediscovered by Bennett in 1880, and was again described by Dr. Ridewood in 1892 in a paper entitled "The Air-bladder and Ear of British Clupeoid Fishes" (*Journ. Anat. Phys.*, XXVI., pp. 26-42). Dr. Ridewood devoted a special section to the posterior opening to the exterior; he showed that it was present not only in *Clupea harengus*, but in *C. pilchardus*, *C. sprattus*, *C. alosa* and *Engraulis encrasicolus*. In *Clupea finta*, however, he found that the air-bladder tapered to a point posteriorly and did not open to the exterior.

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